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September 7, 1971

Cody E&E

Mr. Uldis Karins, P.E.
County Engineer
New Castle County Department of Public Works
Post Office Box 165
Wilmington, Delaware

Dear Mr. Karins:

Enclosed are a set of graphs and a table summarizing the results of ground and surface water quality measurements taken at the Tybouts Corner Landfill since January 1, 1971.

Wellpoint sampling for groundwater quality, stream sampling from Pigeon Run and Red Lion Creek, and domestic water supply sampling from neighboring houses was concluded on June 22, 1971. Sampling from the three ponds on the Landfill property has continued through September 1, 1971.

In all, eight wells (P - 1,2,3,5,7,8,9, and 11) were available for sampling at one time or another during the first six months of the year. Aside from a few fluctuations the water quality from most wells changed very little during the reporting period. Well P-11 is the only well yielding progressively deteriorating water quality. Unfortunately, this wellpoint was lost by bulldozing during regrading operations in May. The deteriorating water quality taken from the well does indicate positive lechate flow through the location of the P-11 wellpoint.

Four stream sites (S-4,5,6, and 8) and two pond sites (S-1 and 3) were sampled monthly from January through June. The analysis of these samples offer no forewarning to the upset pond conditions that occurred in early July.

The forty-fold increase in the BODs level and the three to five-fold jump in chloride and specific conductance measurements between June 22, 1971 and July 12, 1971 implies that the upset condition developed rapidly and was not the result of a long term accumulation of lechate drainage.

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A survey of the landfill site on September 3, 1971 revealed that all three ponds has cleared considerably following the heavy storm that occurred the previous week and partially "flushed" the ponds of their former putrefying contents. The survey also revealed that anaerobic seepage and foul-smelling odors continue to exist at two areas within the landfill.

One of these areas is the surface stream draining into Pond #3 just south of the sand-washing operation. The largest part of this flow is septic lechate seepage and the septic odor near the head of this drainage is very strong.

The worst offender, however, is the drainage stream along the northern slope of the landfill adjacent to the former and present wash pond sites. Seepage in this vicinity, flowing into Pond #1, is anaerobic, black in color, and putrid-smelling. The odor is detectable along the adjacent stretch of Route 301.

Flow direction and location of the seepage strongly suggests that the source for the drainage flow, during the initial upset, and, at present, is the wash ponds that have been constructed over the landfill in this area. The report that dry refuse was excavated beneath the former wash pond does not preclude the likelihood of uneven infiltration and/or channeling of the wash pond water. The threat and potential for profuse leaching and drainage of the landfill coincides with the existance of the wash ponds over or within the confines of landfill material.

At the seepage flow rates observed on September 3, 1971 the pond system can possibly assimilate the lechate inflow. However, this still leaves the fairly large drainage areas with a putrefying condition. An increase in lechate seepage or a reduction in the pond systems assimilative capacity due to high temperature or ice-cover could lead to widespread anaerobic conditions.

The sand-washing operation promotes circulation within the pond system thus, increasing the pond system reaeration. Extended shutdowns of the gravel operation over weekends, etc. could lead to a build-up of the pond BOD levels and thus tax the systems assimilative capacity. This danger of accumulation is particularly relevant to Pond #3 due to the lack of circulation within this pond.

If the lechate seepage is not controlled by removal of the wash pond then it is recommended that the evolution of putrid odors and the flow of putrescible lechate into the pond system be reduced to acceptable levels by lagooning and aerating the two surface drainage streams prior to their discharge into the ponds. The lagooning can be accomplished by simply constructing a small overflow dam across each of the drainage channels.

Nitrate, pH and bacterial analysis were made of the tap water samples collected from houses bordering the landfill site. A summary of these measurements is shown by Table 2. The pH of these tap water samples remains low and a potential contributor to corrosion. Nitrate and coliform are at low and reasonable levels. The bacterial quality of both pond water and tap water were analyzed by the Presumptive Coliform Test, two methods of Confirmed Coliform testing and by the IMViC Coliform Classification Series of tests. These tests established that the coliform organisms detected in the ponds and tap water are of a non-fecal origin.

Orthophospate was a parameter that was monitored yet not plotted on the enclosed graph because of its almost total absence from the samples collected.

Enclosed with the attached tables and graphs you will find a copy of a masters thesis by Mr. James P. Chao entitled "Hydrologic Study of Sanitary Landfill for New Castle County, Delaware." Mr. Chao's study was sponsored in part by your contract with the University and is forwarded herein to insure that you have a copy for your files.

Please inform us if there is any further service that we can offer you regarding sampling and analysis at the Tybouts Corner Landfill. In the interim period we will continue to provide surveillance of the lechate seepage into the pond system.

Sincerely yours,

Gerald P. Rasmussen

Gerald P. Rasmussen, P.E.
Lecturer

GPR/pw

Enclosures

cc: S. K. Banerji
E. Chesson, Jr.
L. L. Olson

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TABLE 1

TABULATION OF RESULTS

LABORATORY MEASUREMENTS OF SAMPLES COLLECTED AT TYEOUTS CORNER LANDFILL

PARAMETER MEASURED	SAMPLING DATES											
	8-10-71			8-13-71			8-17-71			8-24-71		
pling Location	S-1	S-2	S-3	S-1	S-2	S-3	S-1	S-2	S-3	S-1	S-2	S-3
perature (°C)	-2	-2	-2	29	25	28	29	26	28	28	25	2
	6.6	6.8	7.1	6.7	6.8	7.1	6.4	6.6	6.8	6.6	6.8	6.8
O. (mg/l)	-	2.3	0.0	6.6	4.2	0.2	-2	-2	-2	5.6	4.5	0.0
$_5$ (mg/l)	126	120	135	-1	-1	-1	129	147	201	13	17	29
rate (mg/l as NO_3)	0.8	0.0	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.4	0.3	0.3
cific Conductance ($\frac{\text{micro-mhos}}{\text{cm}^2}$)	220	240	270	225	225	250	230	245	260	240	260	280
dness (mg/l as $CaCO_3$)	130	154	164	118	130	152	122	138	158	118	140	152
oride (mg/l as Cl^-)	48	47	50	48	49	50	50	50	51	52	55	53
iform Density (colonies/100 ml.)	2600	6200	17,400	7300	5000	11,000	3400	22,000	30,000	20,000	700	-1

SAMPLE LOCATION DESCRIPTIONS

S-1: First pond, located along north fence, at point of discharge to middle pond.

S-2: Outlet at south end of middle pond.

S-3: South end of southernmost pond.

Fallicious results

No sampled

plm
/71

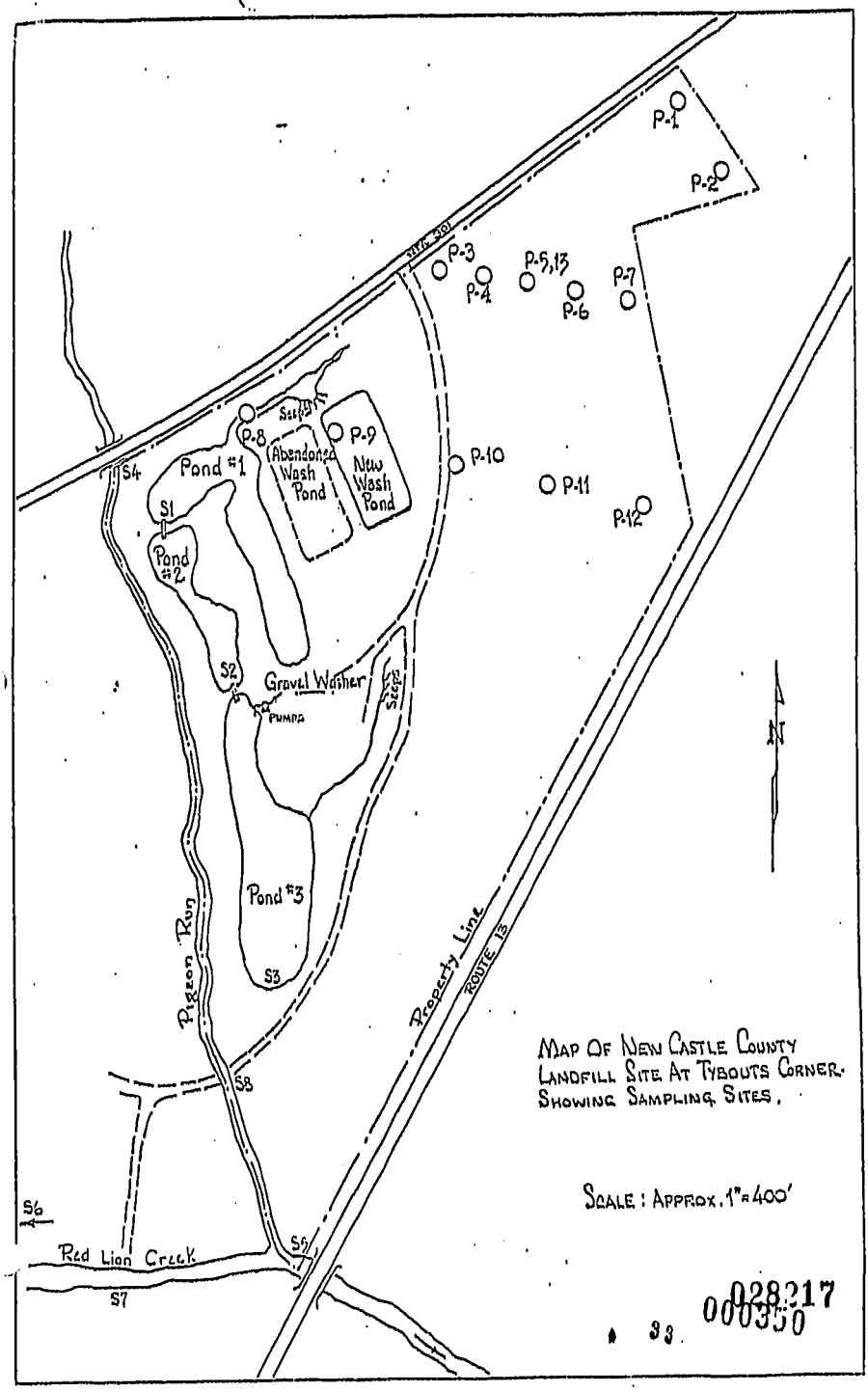
TABLE 2

Summary of Domestic Water Supply Sample Analysis
Taken from Houses in Vicinity of Tybouts Corner Landfill

Second Quarter 1971

Parameter/Date	Residence					
Total Coliform	Baker	Barnes	Ford	McCafferty	Webb	Wolfe
4/28	0	0	ns	29	5	0
5/25	0	0	>16	ns	0	>16
6/22	0	0	0	ns	0	0
pH						
4/28	5.9	6.2	ns	6.5	6.4	5.9
5/25	6.2	6.2	ns	ns	6.0	6.1
6/22	6.2	6.1	ns	ns	7.0	5.8
Nitrates						
4/28	0.0	0.2	ns	0.7	0.0	2.8
5/25	0.3	0.2	0.2	ns	0.3	3.6
6/22	0.5	0.4	ns	ns	0.0	3.4

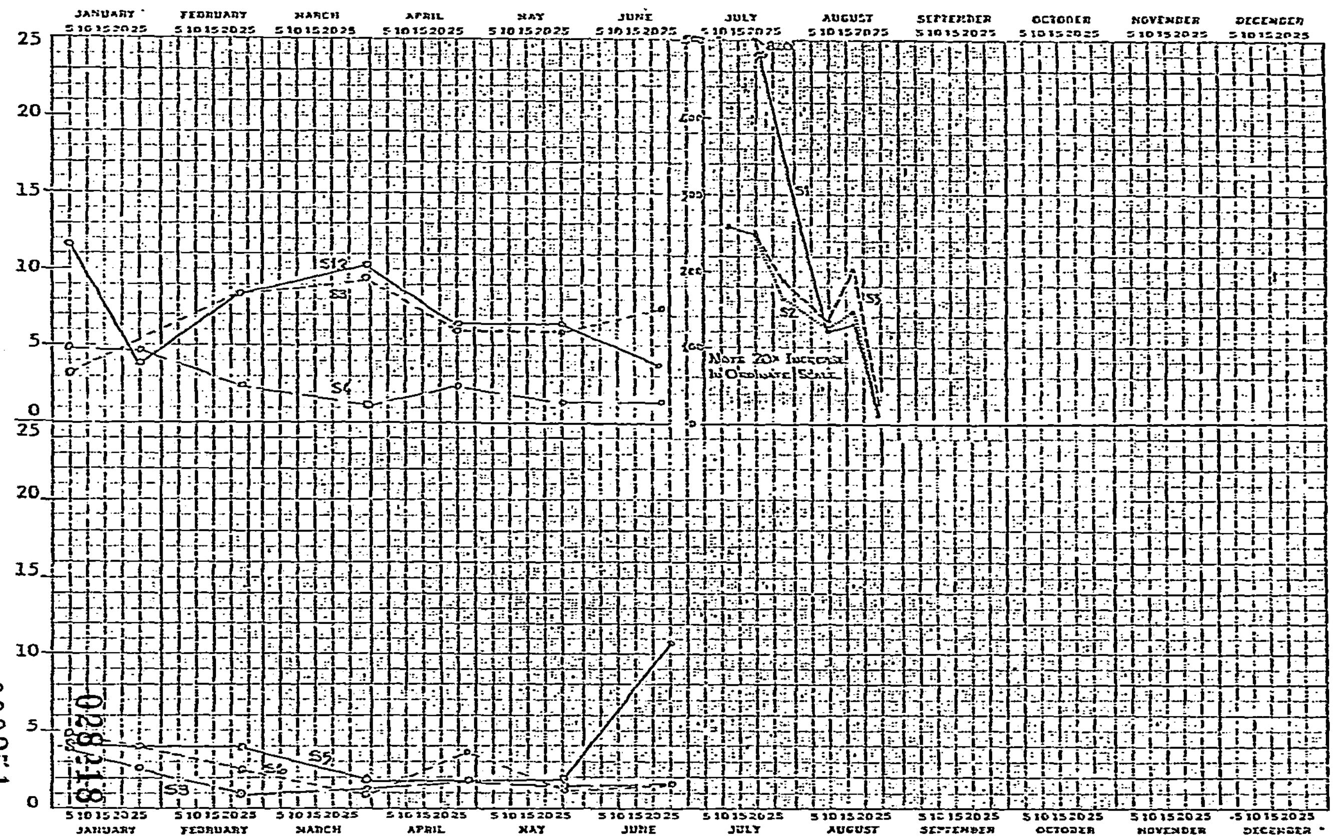
ns - not sampled.



MAP OF NEW CASTLE COUNTY LANDFILL SITE AT TYBOUTS CORNER. SHOWING SAMPLING SITES.

SCALE : APPROX. 1" = 400'

1971



B.O.D. (Streams)

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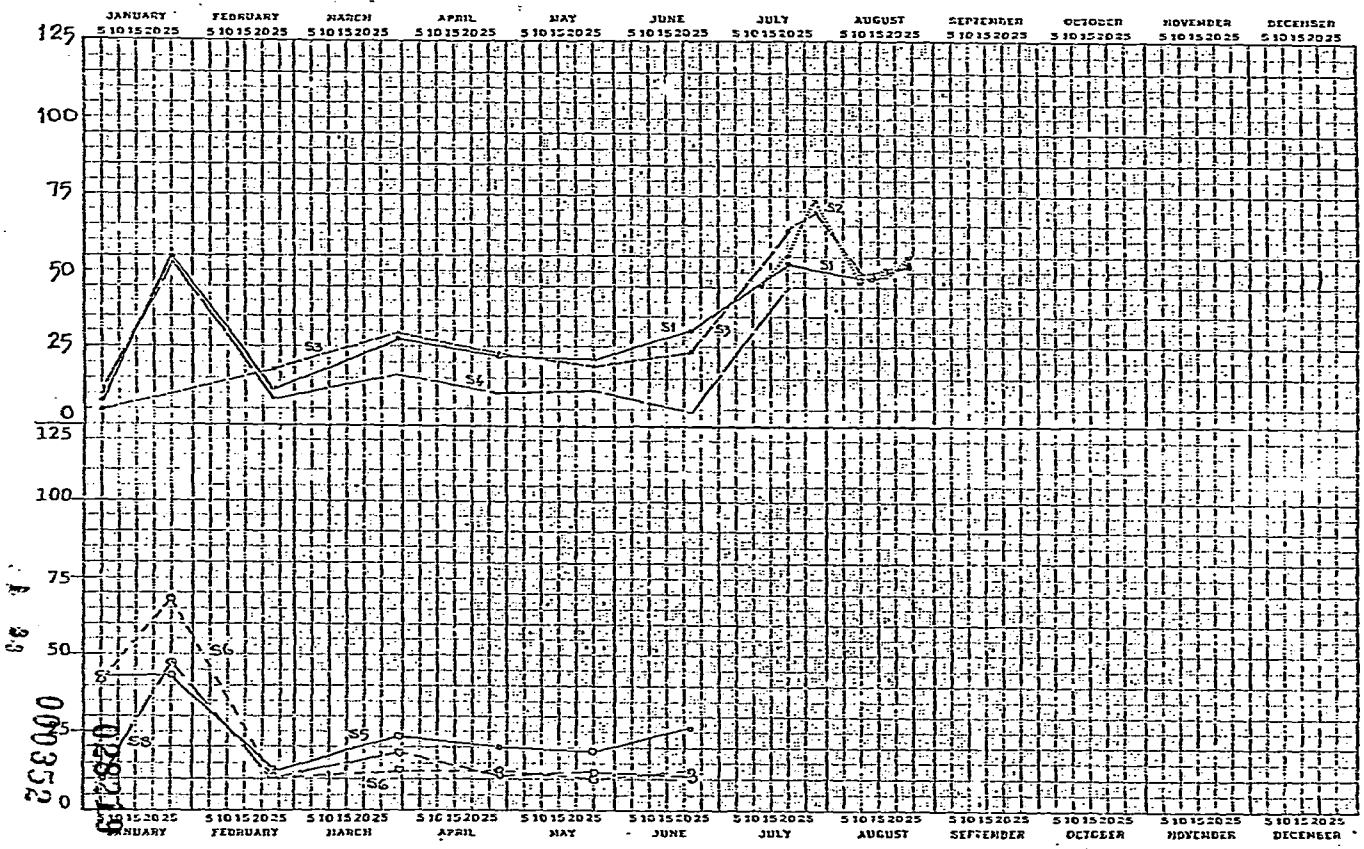
1971 -



Chlorides (streams)

KEUFFEL & ESSER CO.

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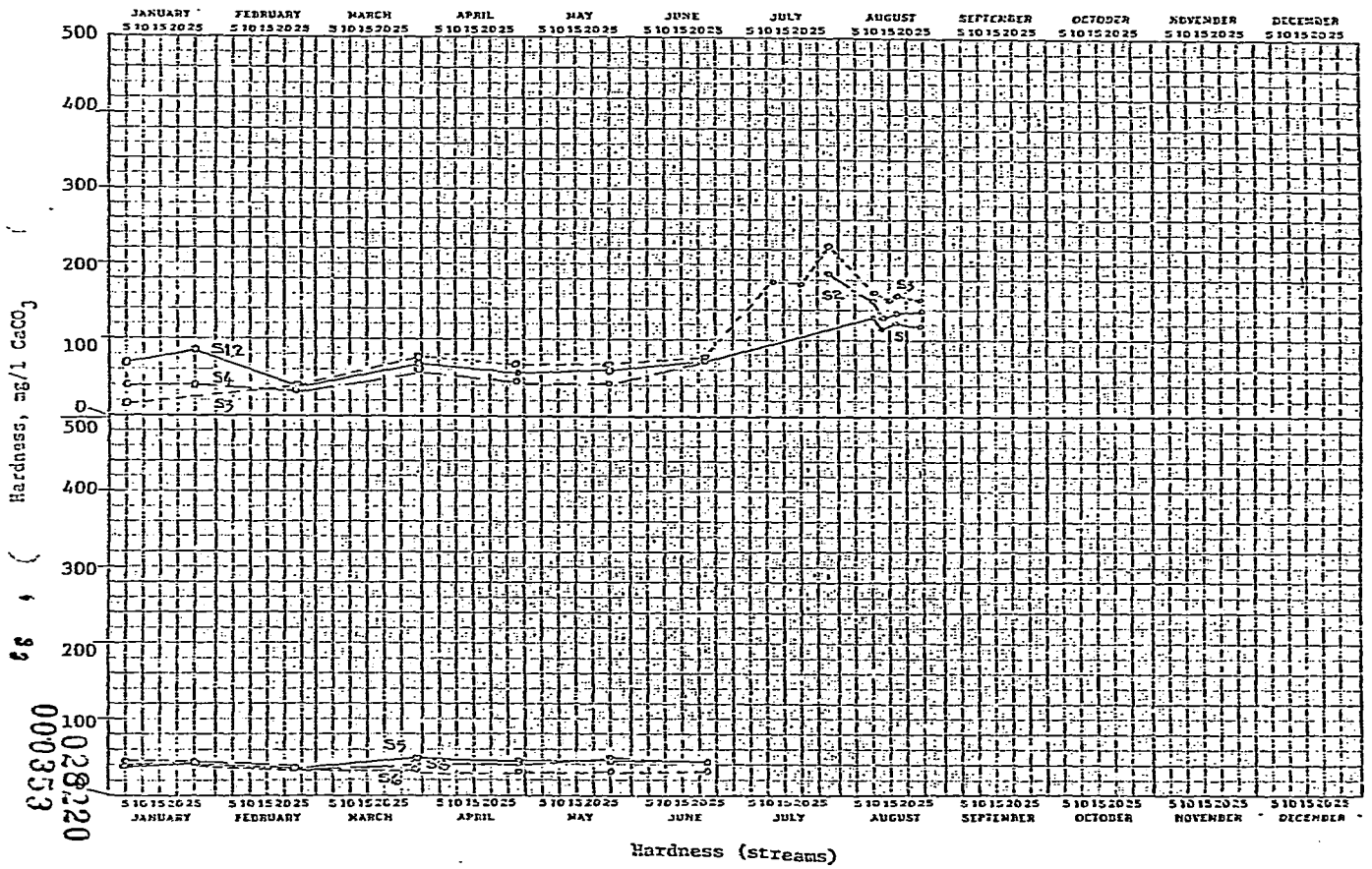
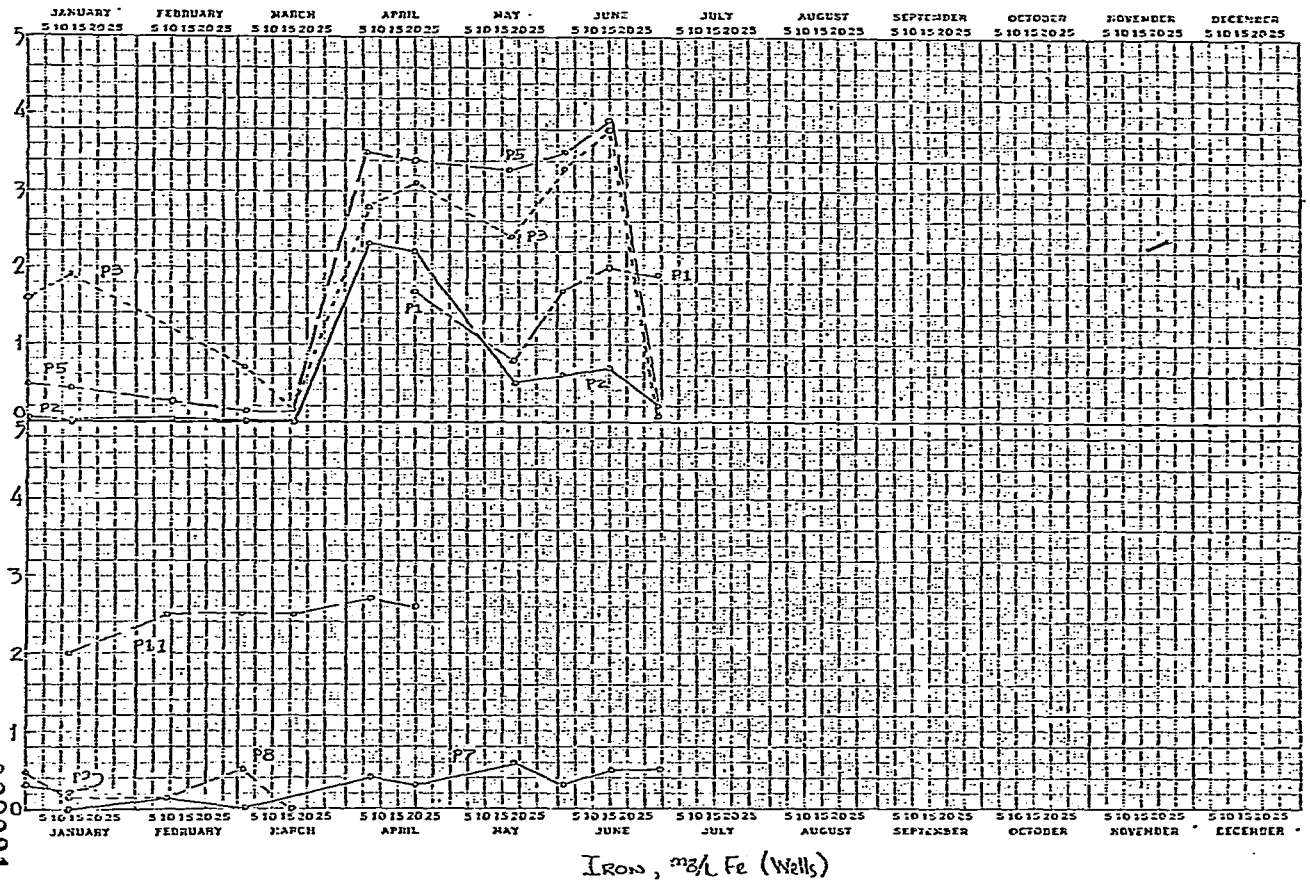


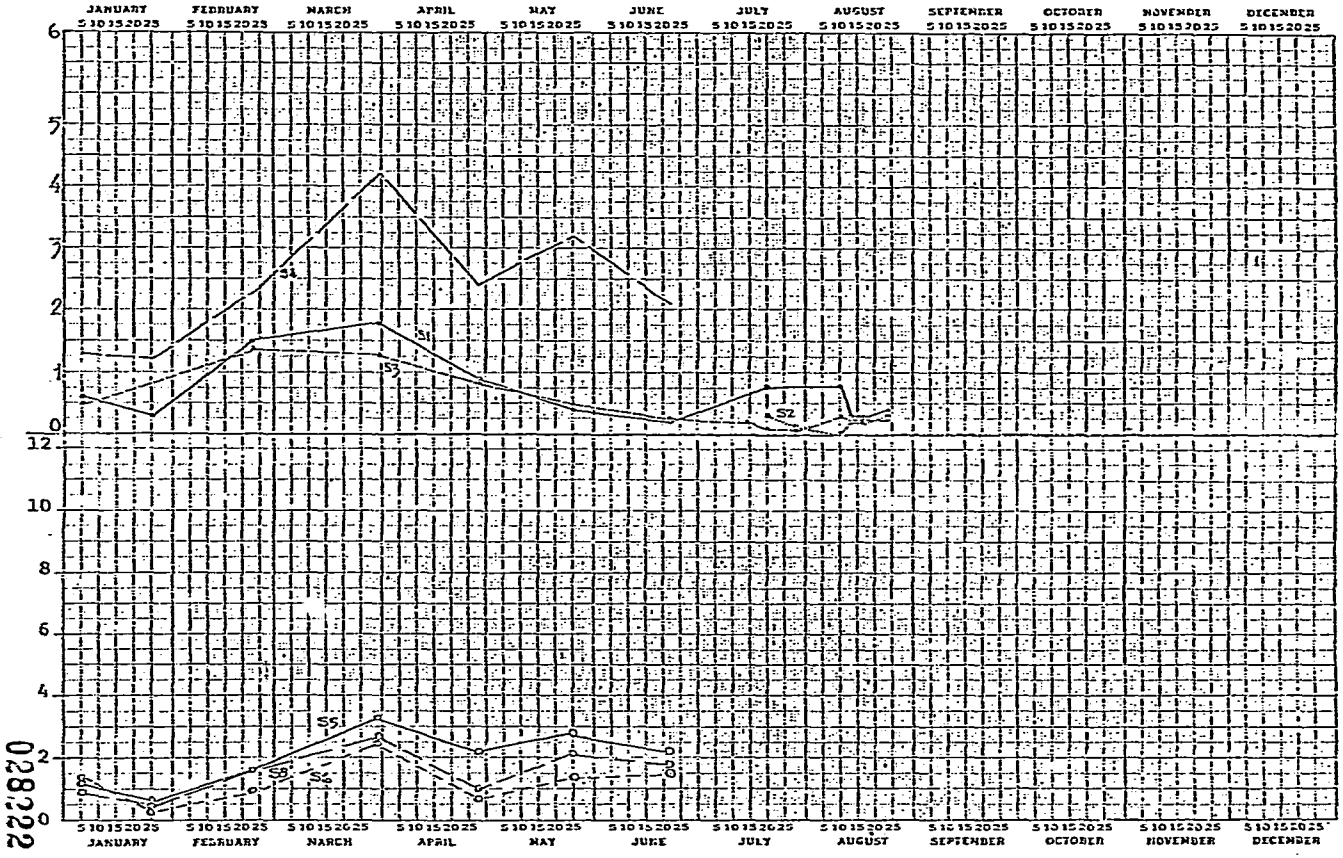
Hardness (streams)

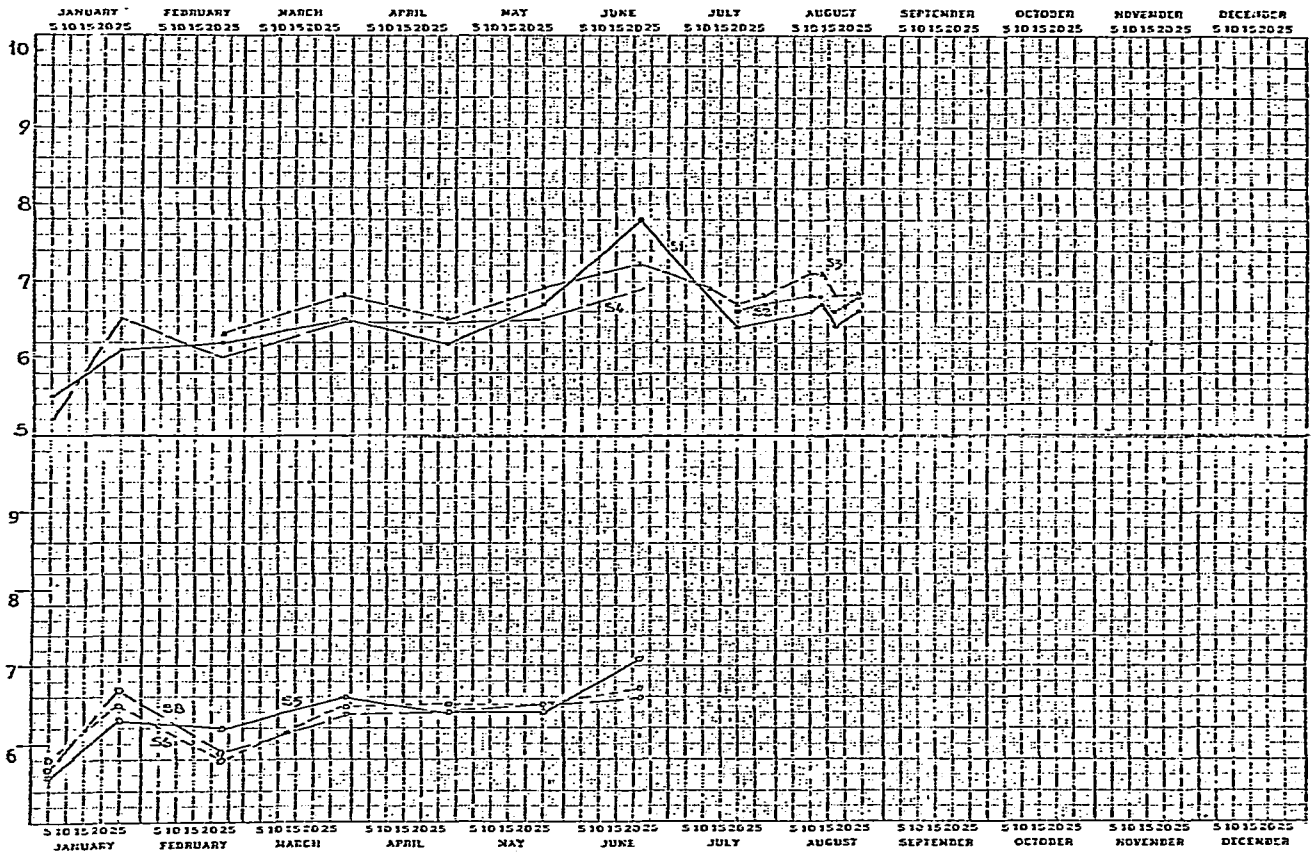
00033
020820



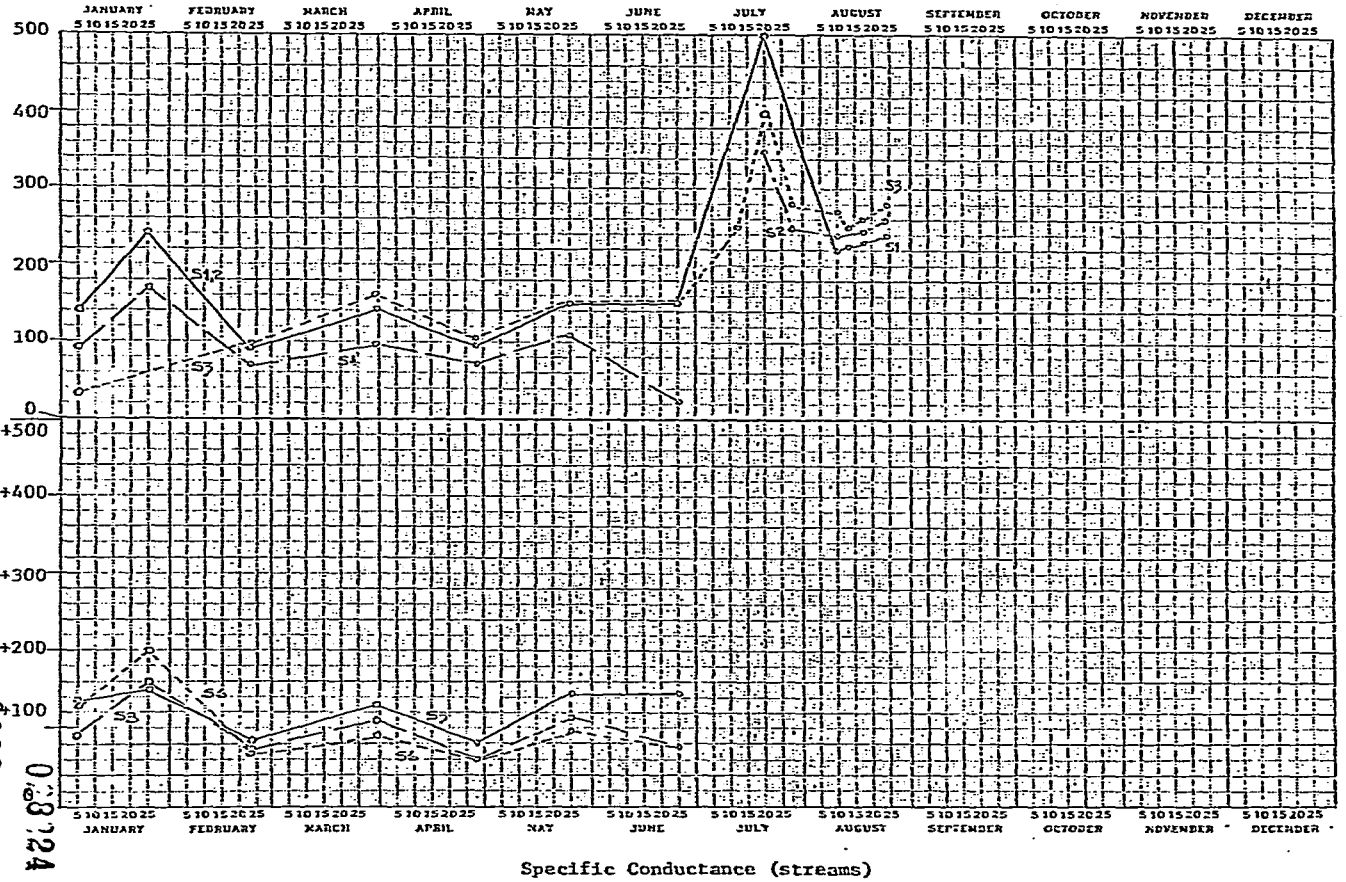
IRON, mg/L Fe (Wells)

1971





pH (streams)



Specific Conductance (streams)

KEUFFEL & ESSER CO.

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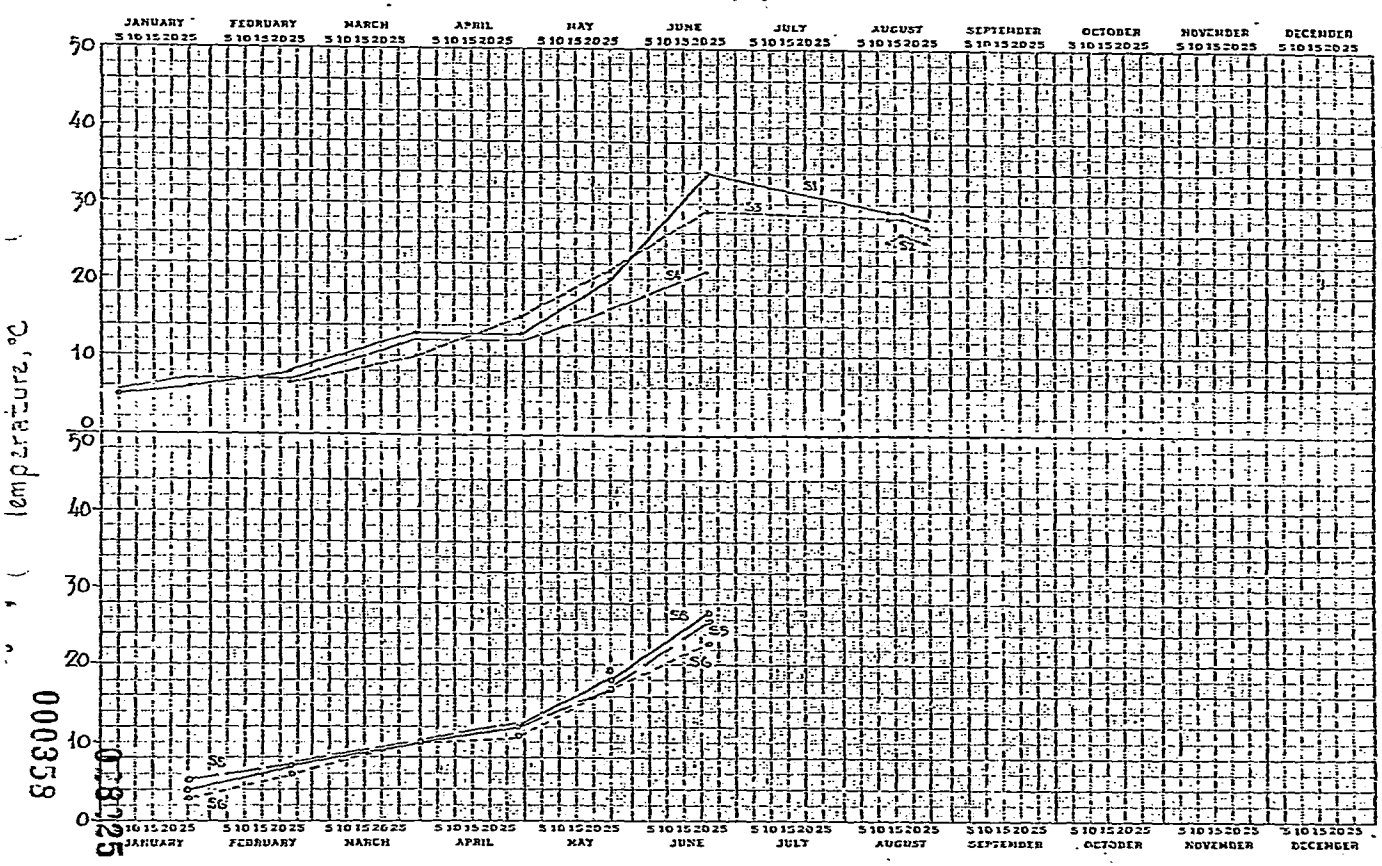
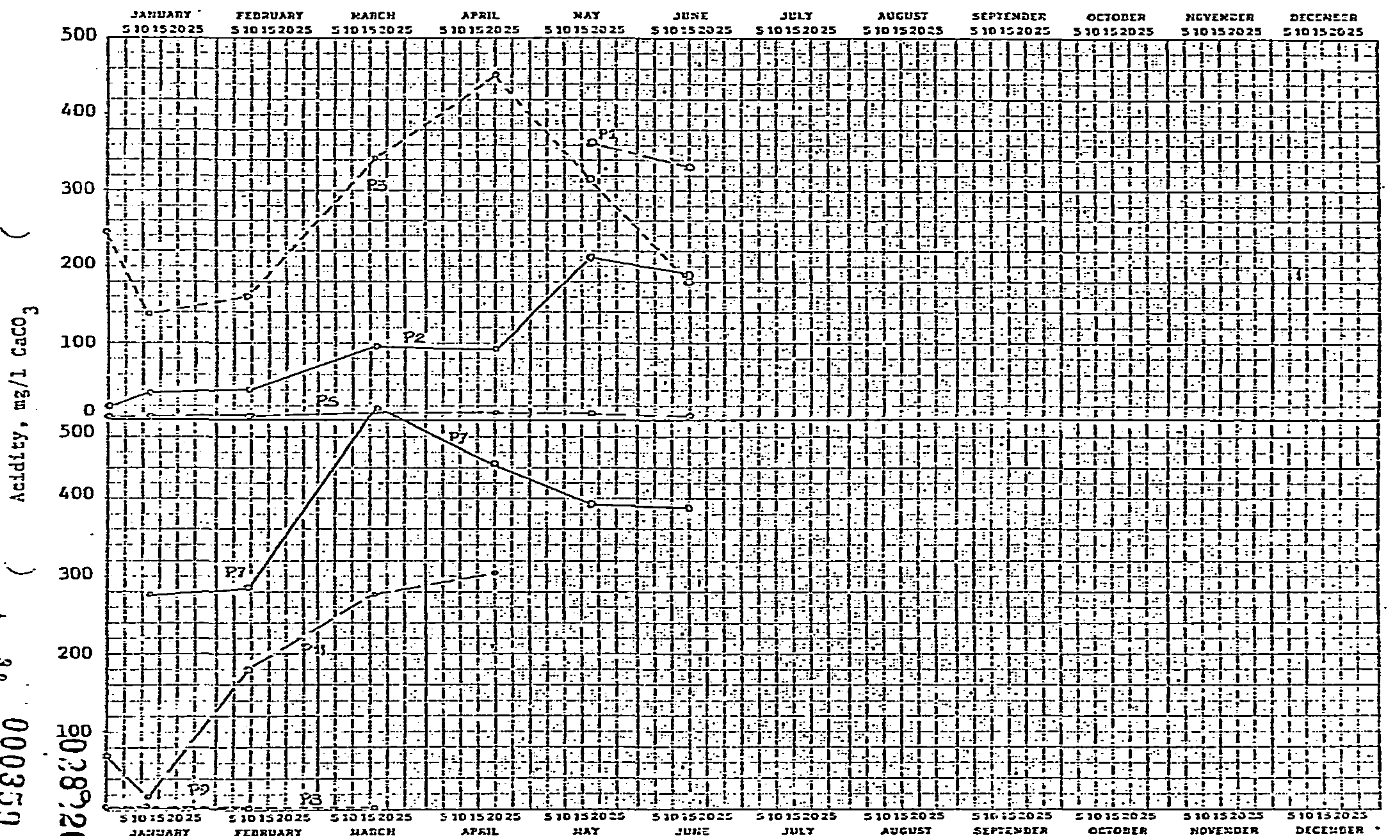


Temperature, °C

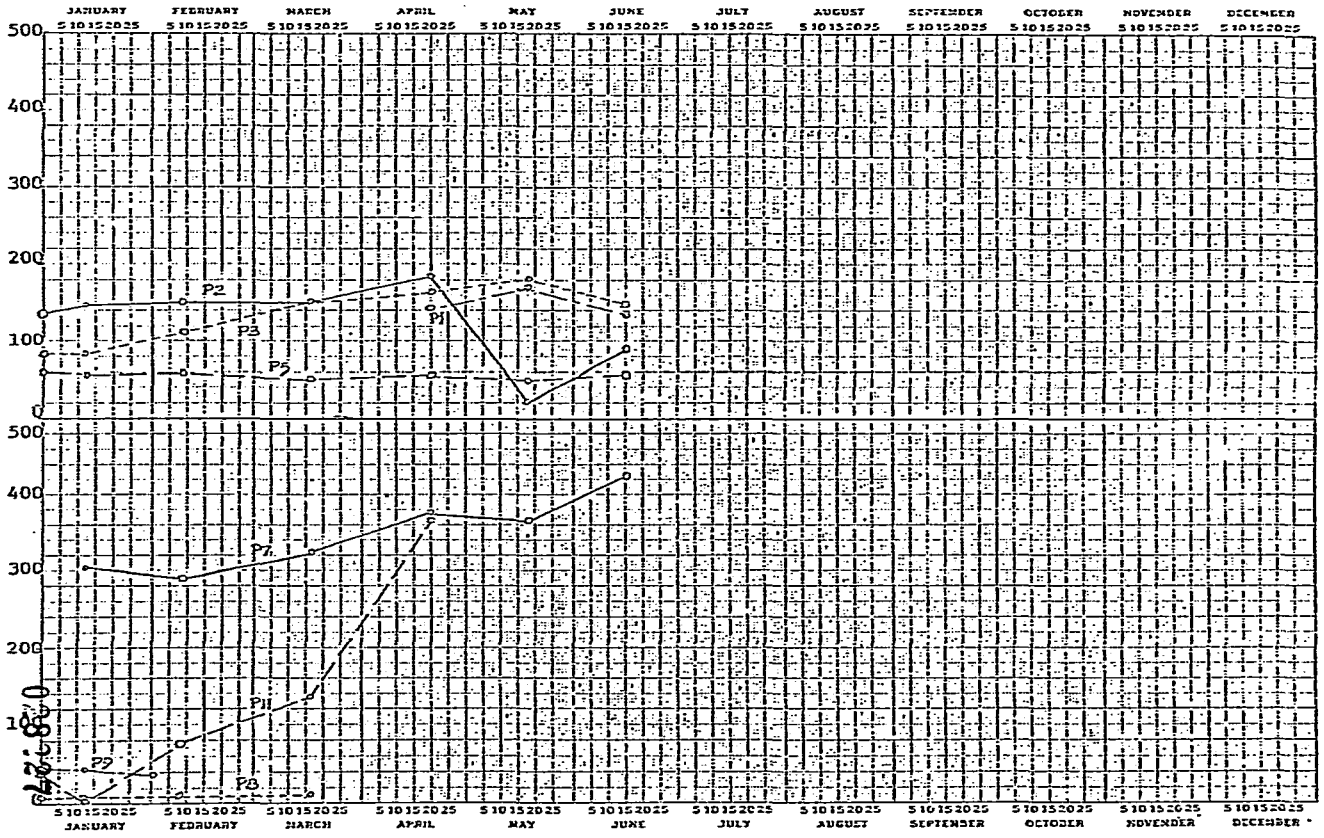
Temperature, °C (Streams)

1971



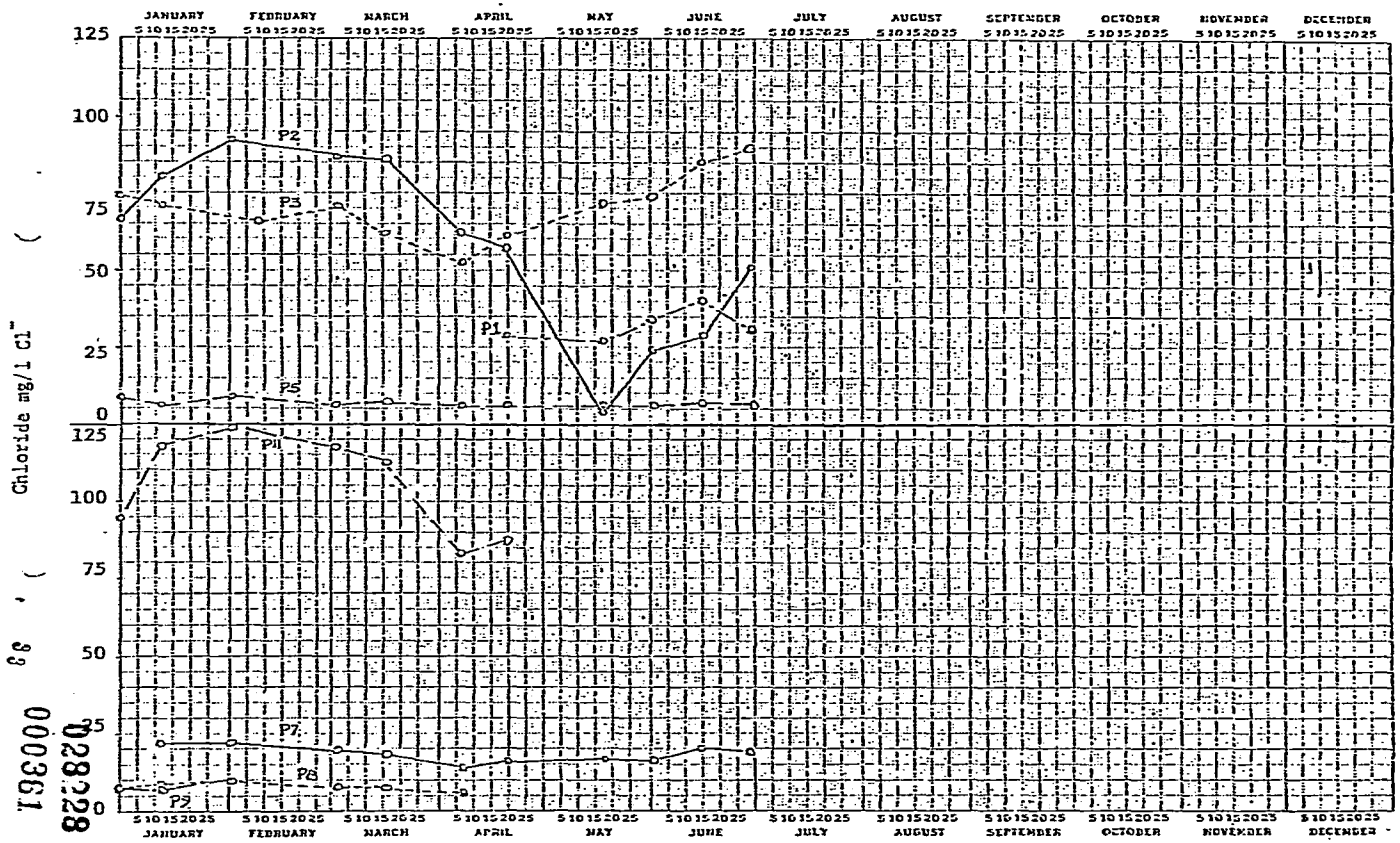
Acidity (Wells)

1971

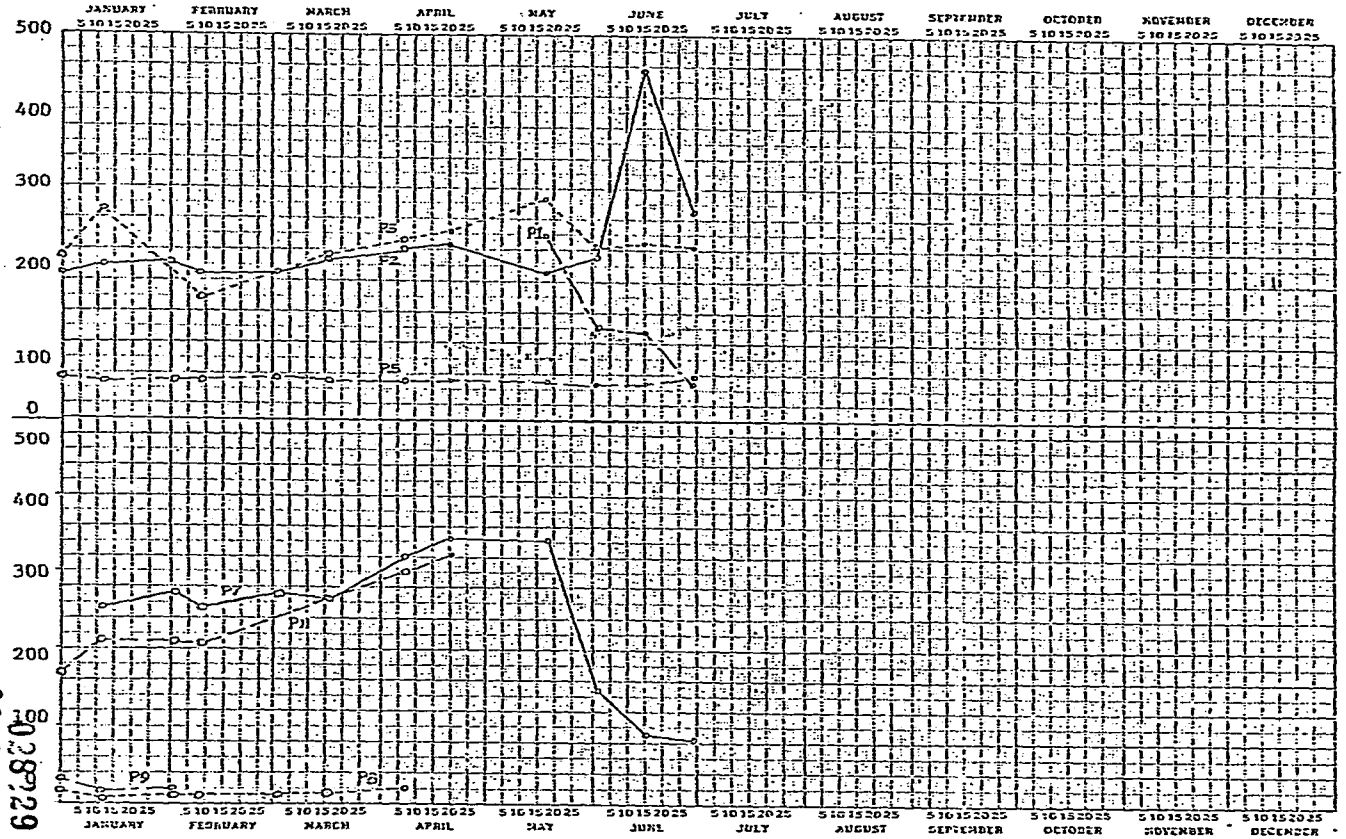


Alkalinity, mg/l $CaCO_3$

Alkalinity (Wells)



Chloride (Wells)



Hardness (wells)

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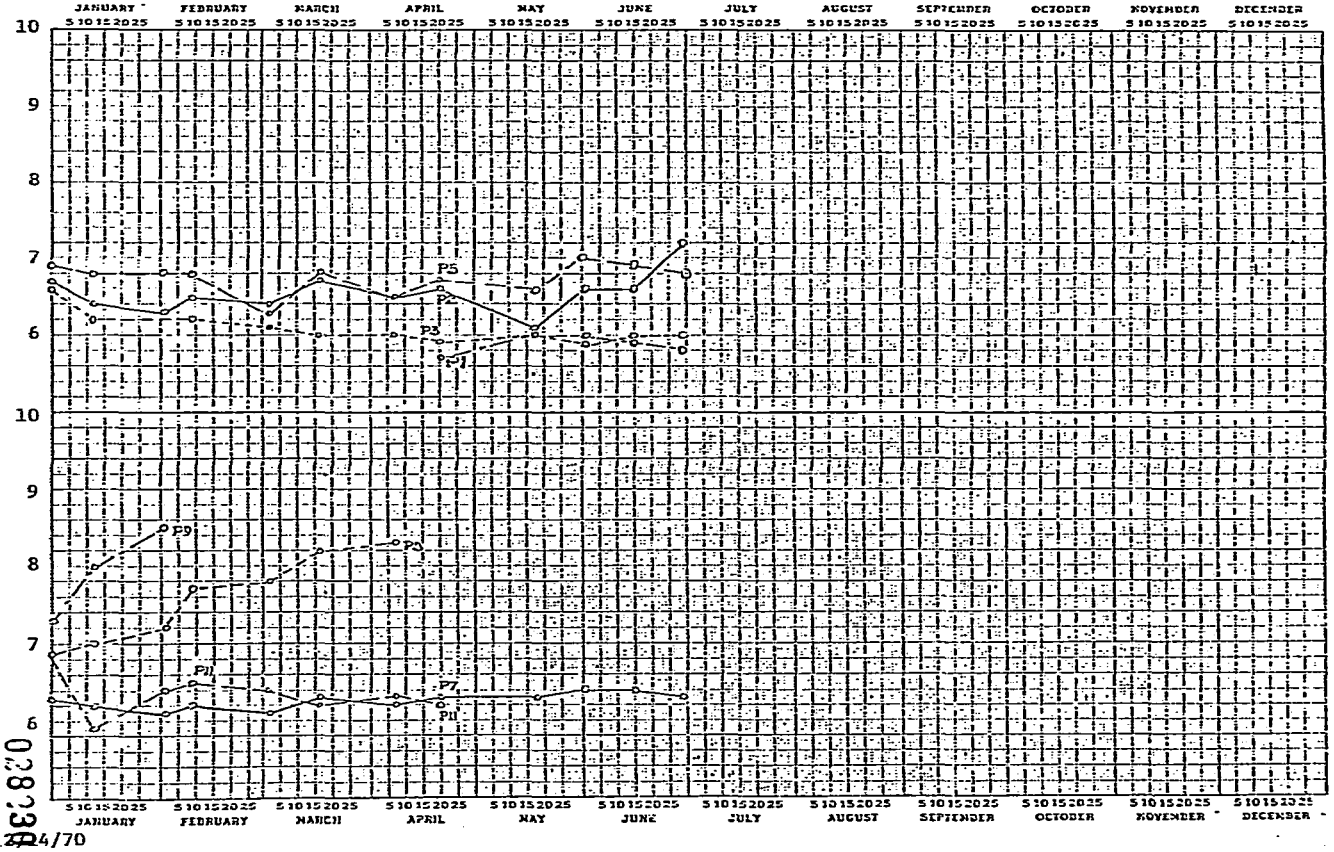

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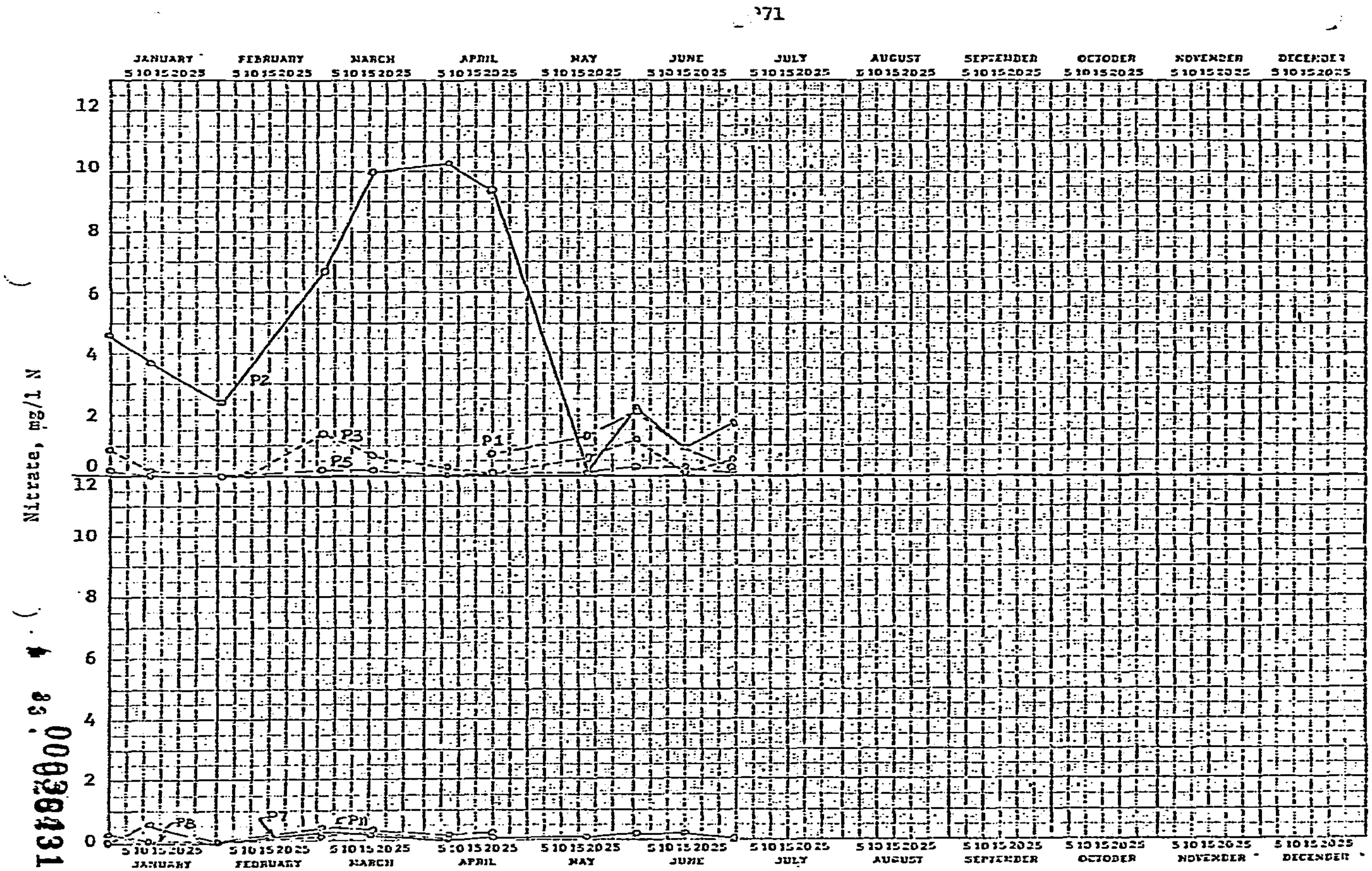
pH (Wells)

KEUFFEL & ESSER CO.



Nitrate (Wells)

00036431

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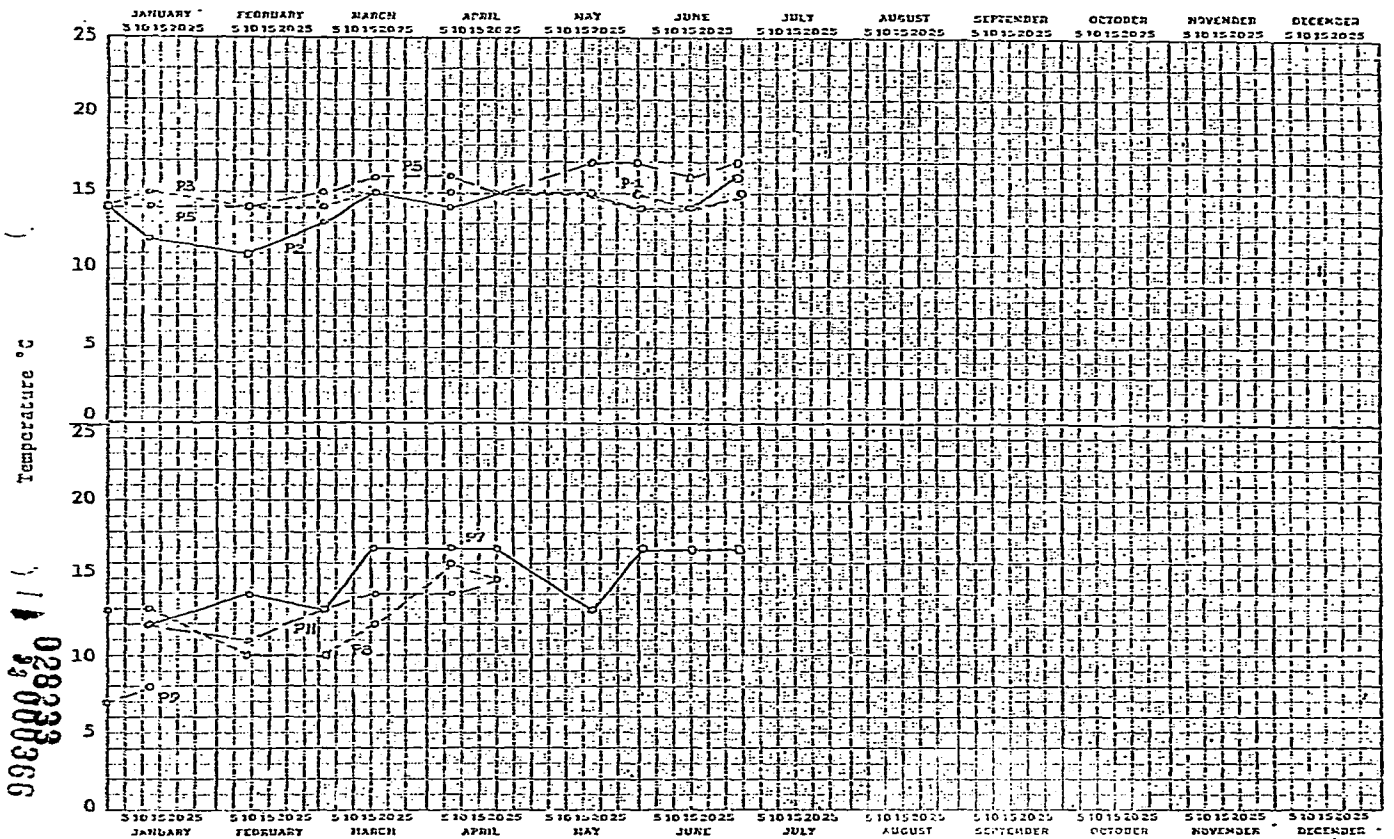

Temperature (Wells)